

# Missouri's Biggest Climate Challenge

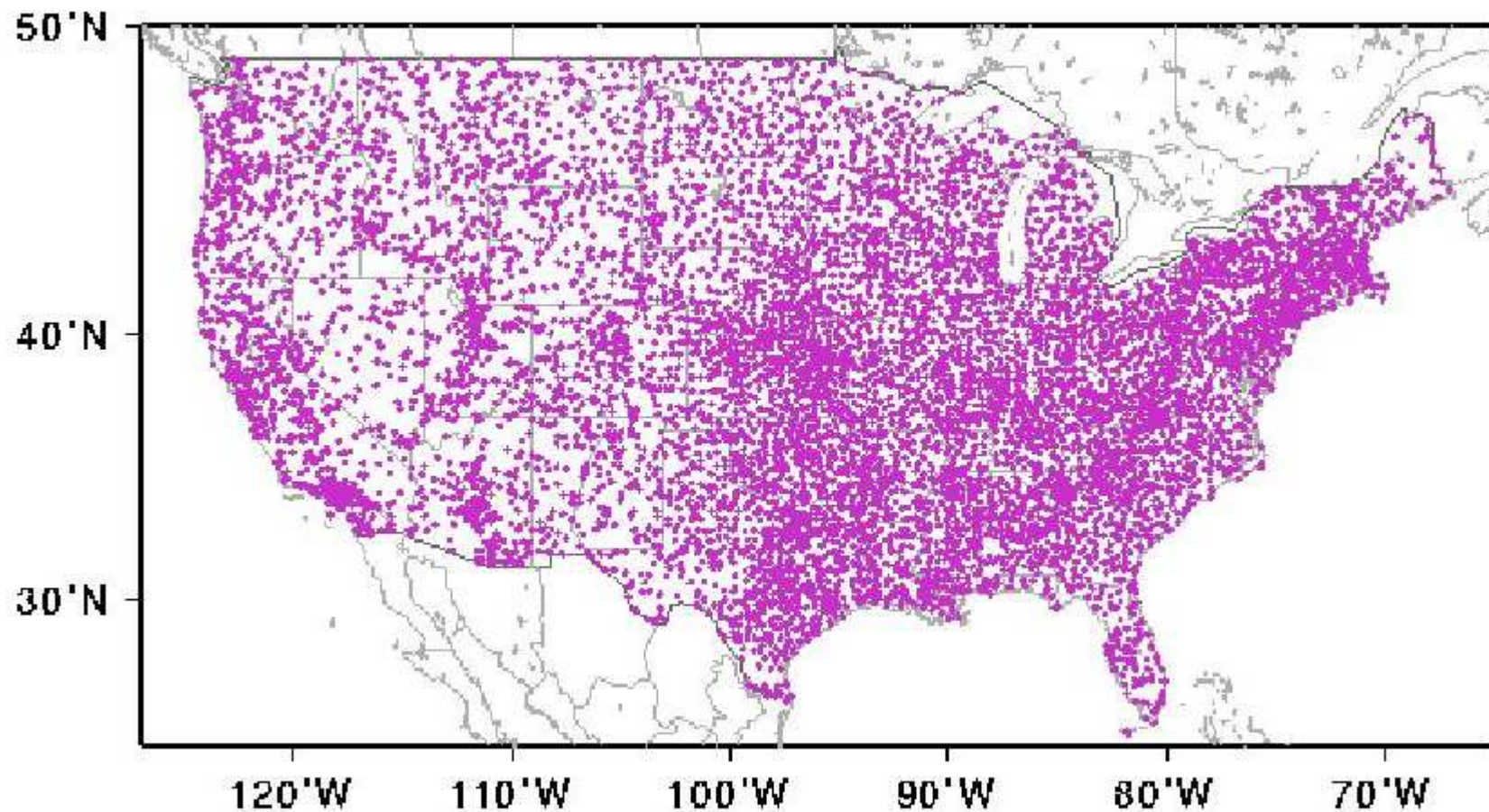
**Pat Guinan**  
**Extension\State Climatologist**  
**University of Missouri**  
**Commercial Agriculture Program**



**Governor's Conference on Natural Resources**  
**Panel Discussion: Environmental Impacts of Extreme Events**  
**White River Conference Center, Springfield, MO, Nov 11-13, 2014**

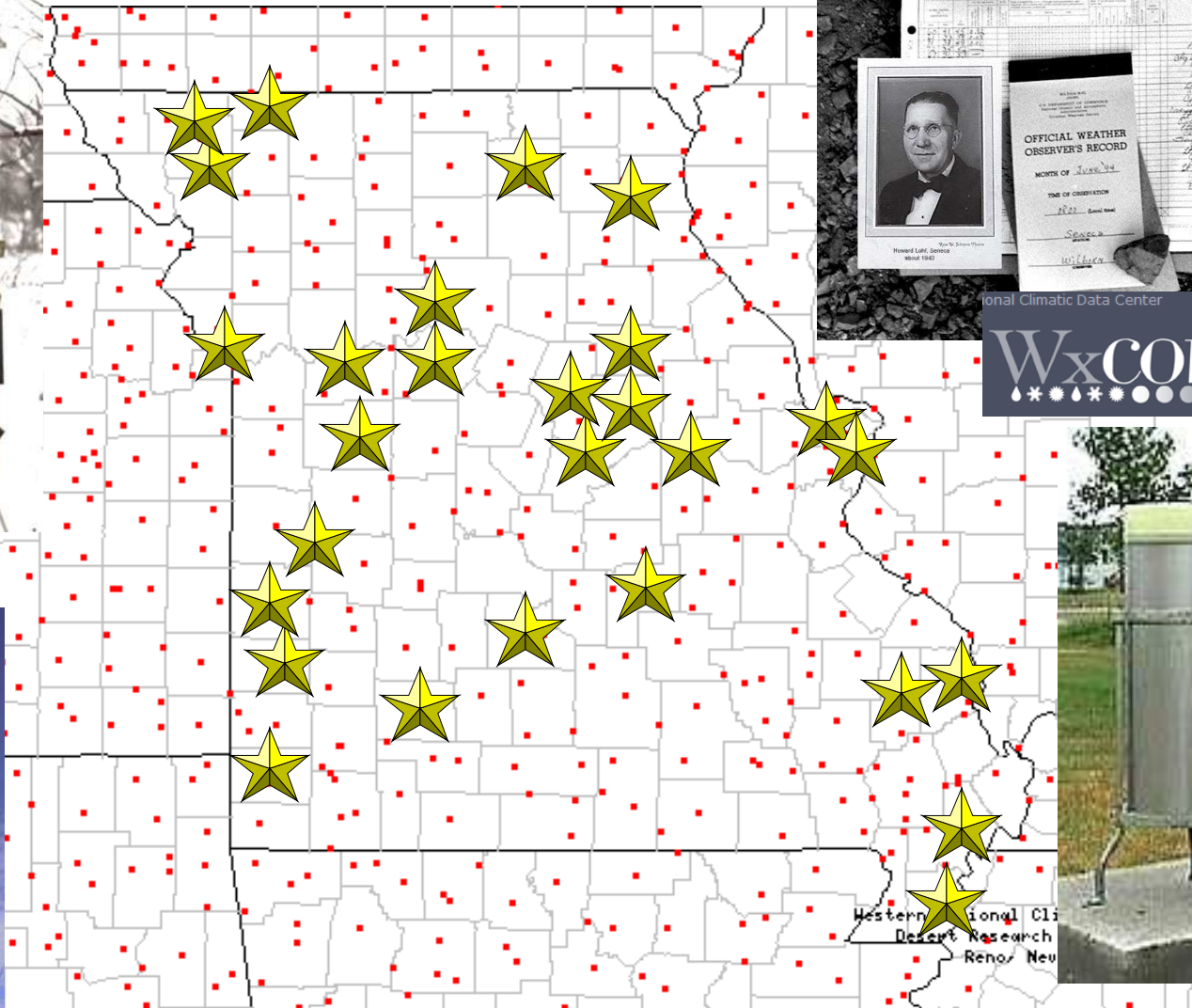
# **U.S. National Weather Service Cooperative Weather Station Network**

**“The Backbone of the Nation’s Climate Records”**



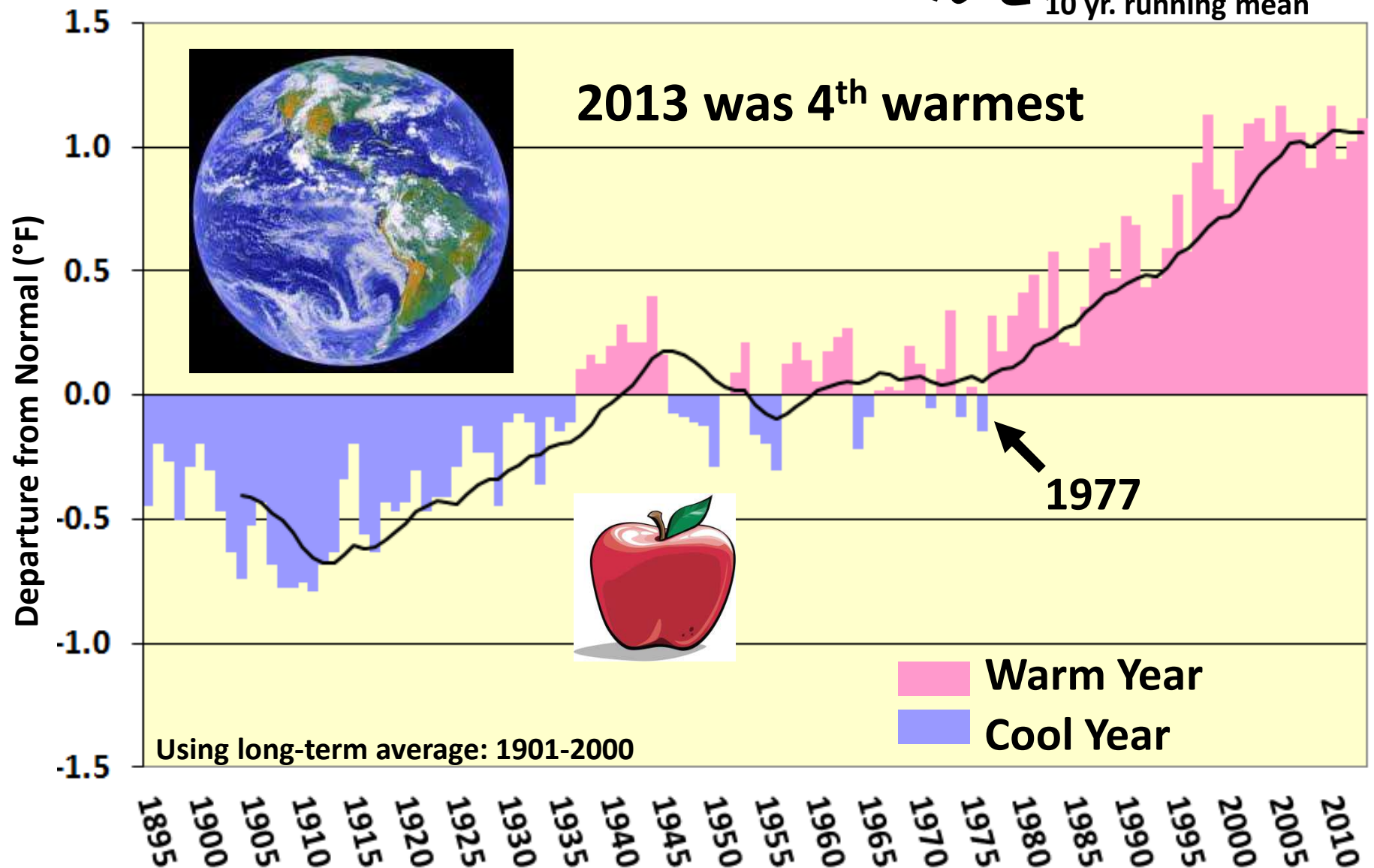
# NWS Cooperative Network in Missouri

★ 28 Pioneer Stations (still active)



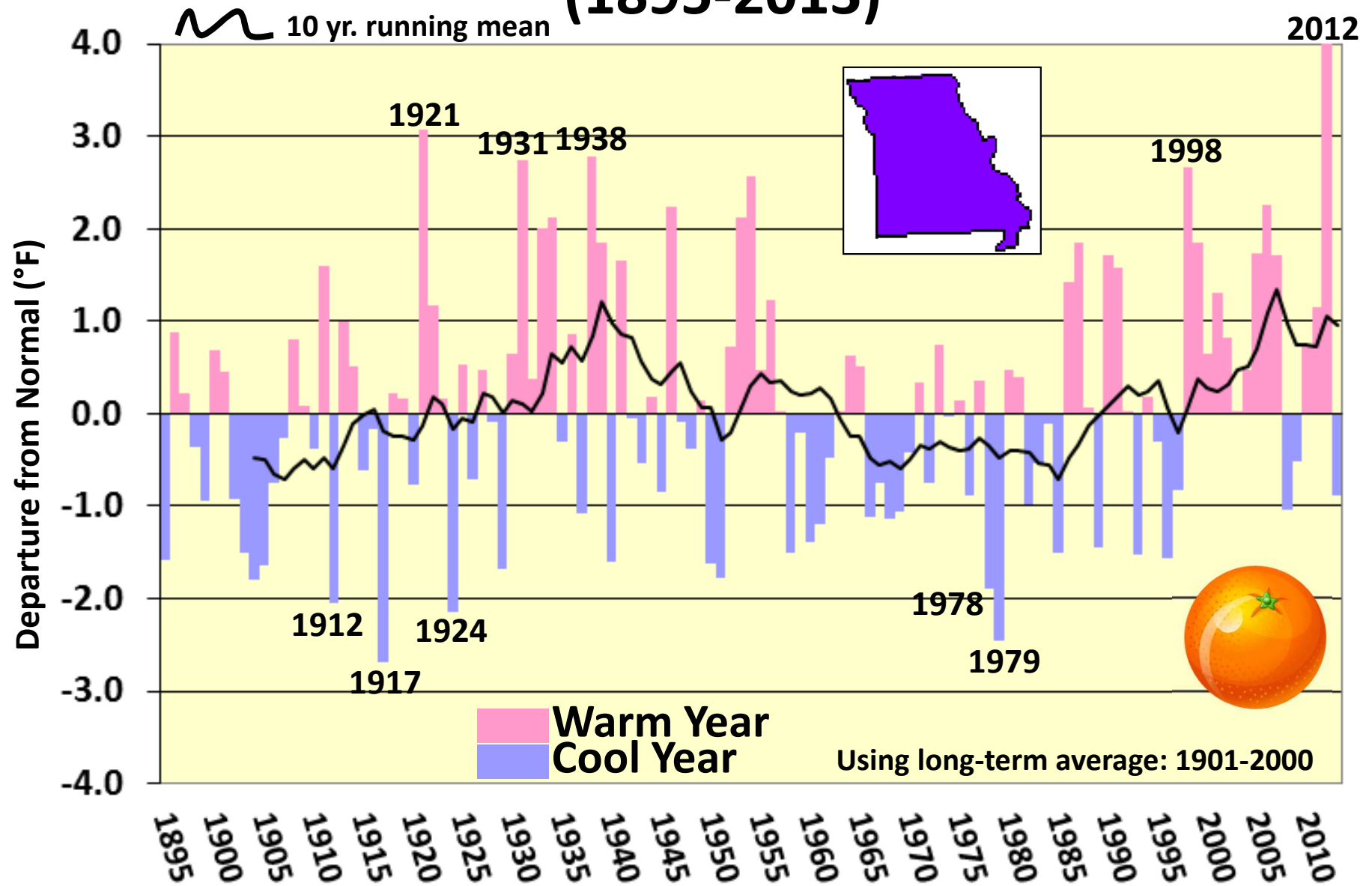
# GLOBAL TEMPERATURE ANOMALIES (1895-2013)

 10 yr. running mean



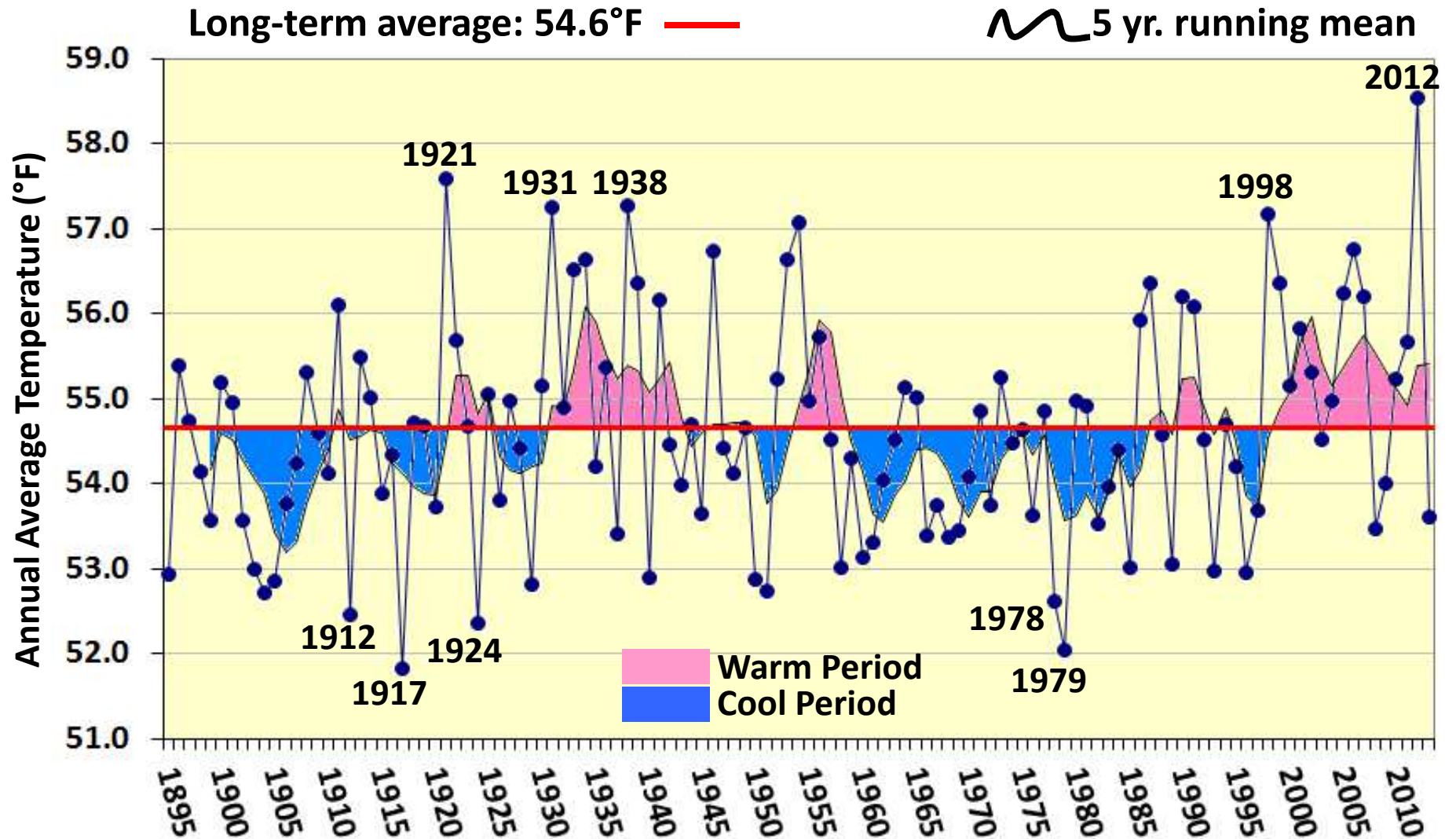
Source: NOAA/Missouri Climate Center

# MISSOURI TEMPERATURE ANOMALIES (1895-2013)

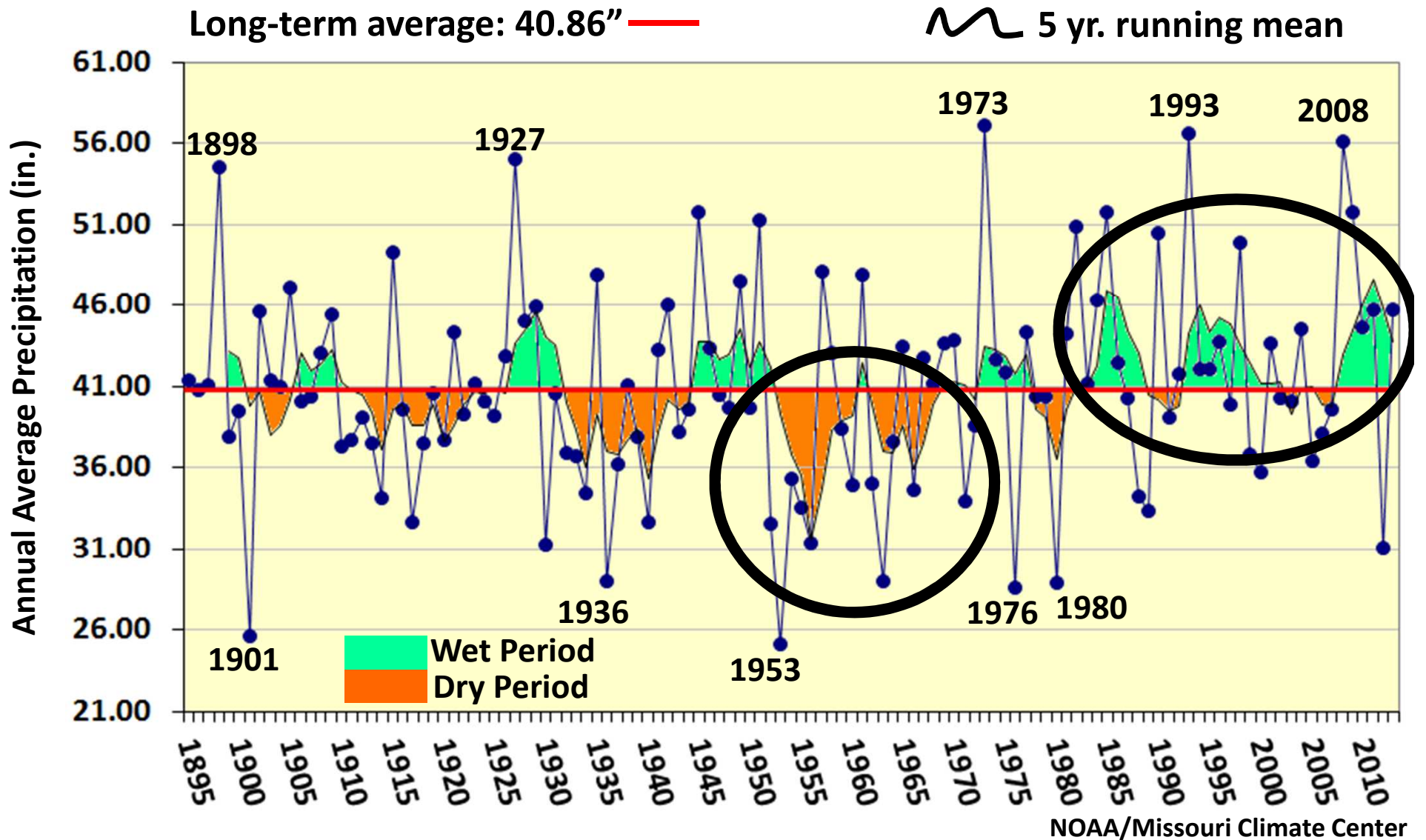


Source: NOAA/Missouri Climate Center

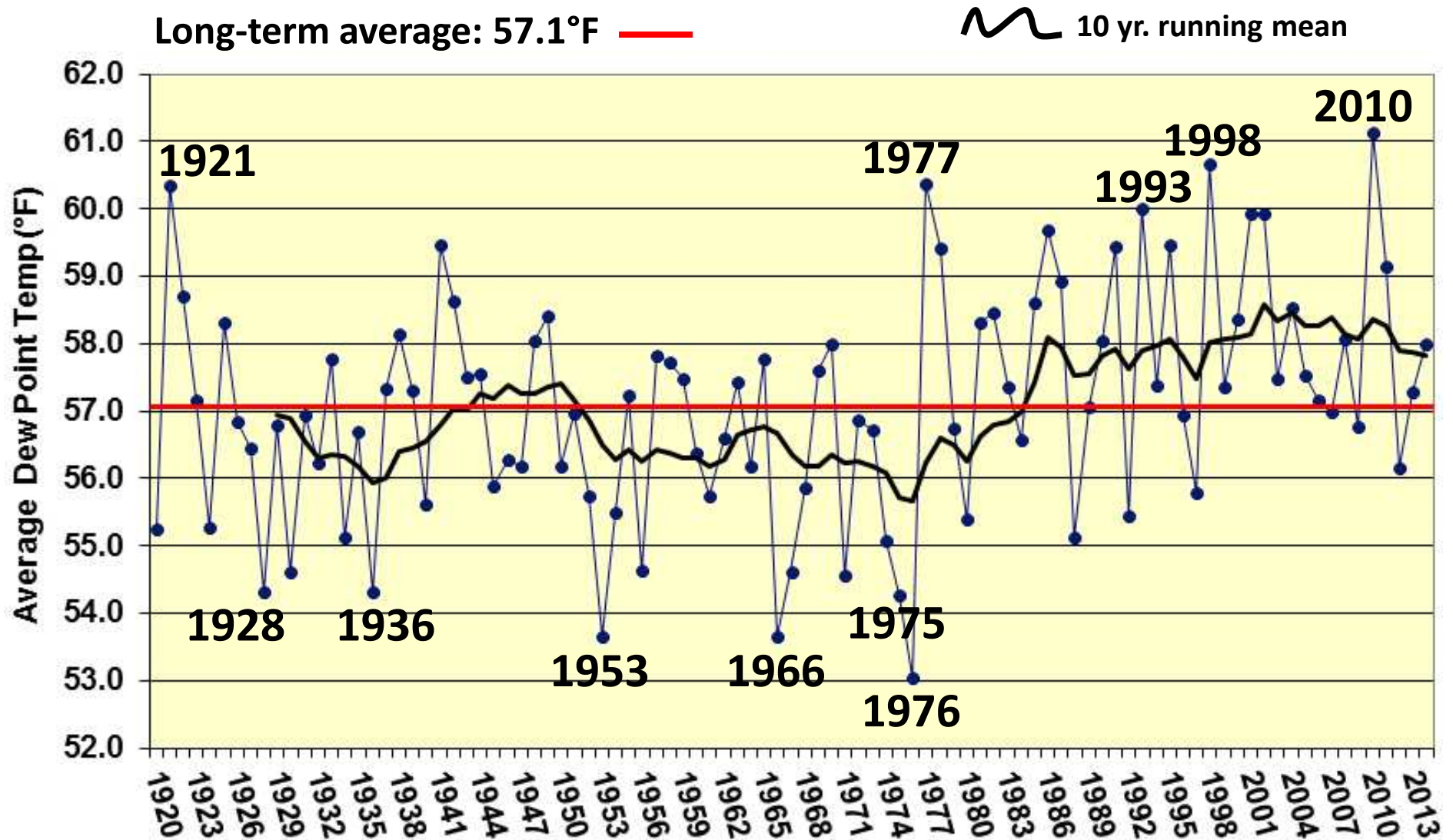
# Missouri Annual Average Temperature (1895-2013)



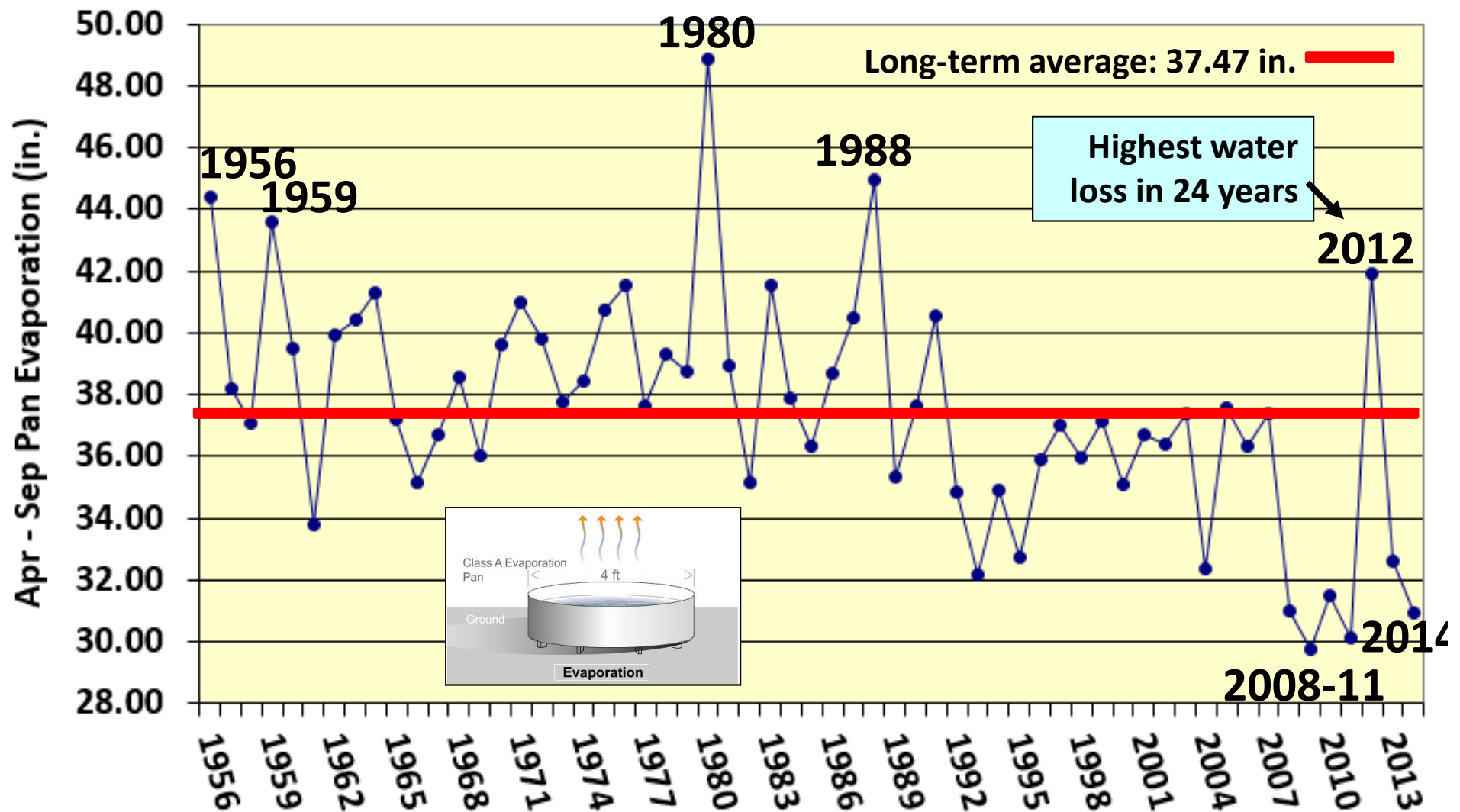
# Missouri Annual Average Precipitation (1895-2013)



# Average Apr-Sep Dew Point Temperature Columbia, MO, 1920-2014



# Class A Pan Evaporation Apr-Sep (in.) HARC\*, New Franklin, MO, 1956-2014



\*Horticulture and Agroforestry Research Center

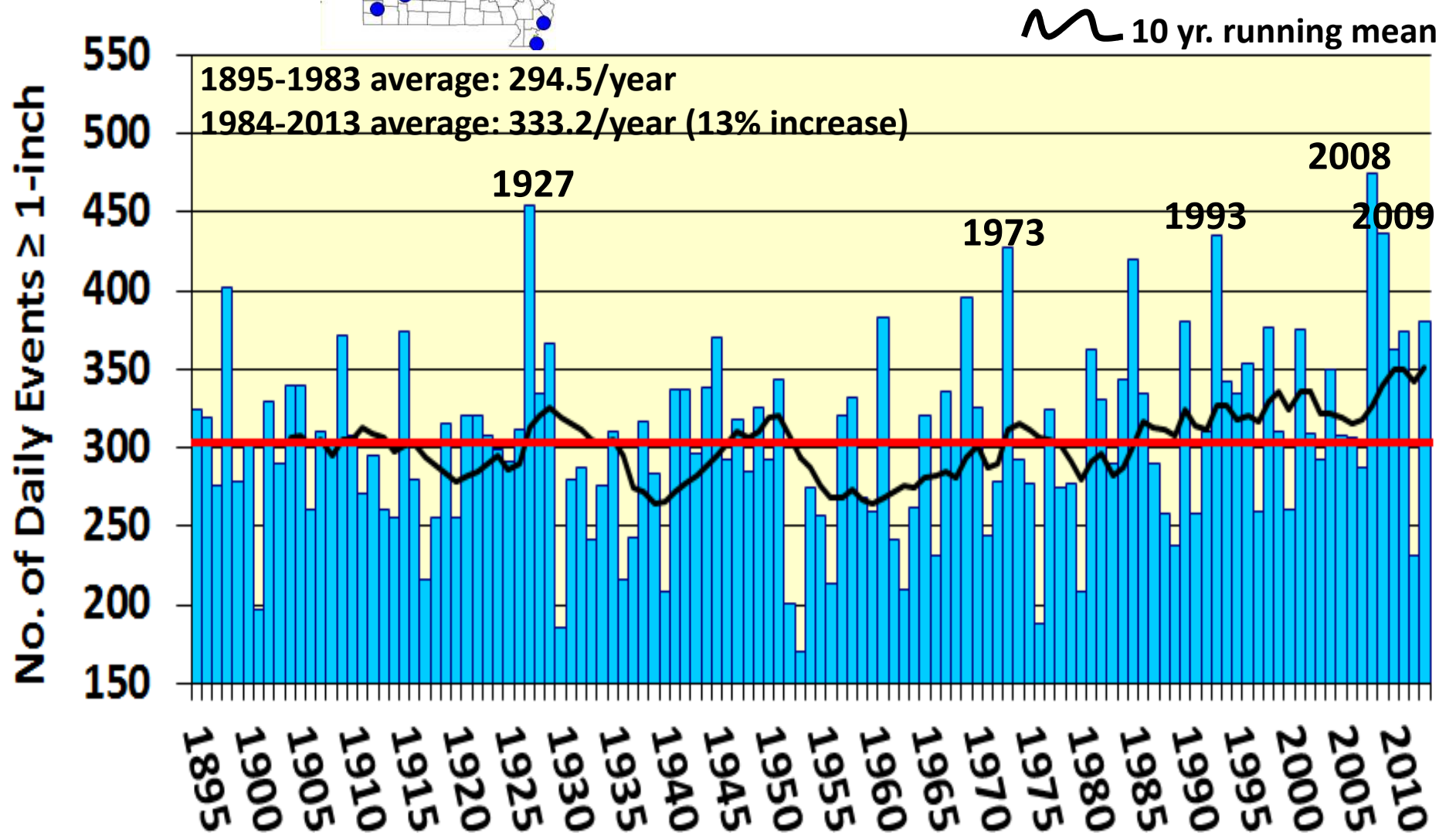
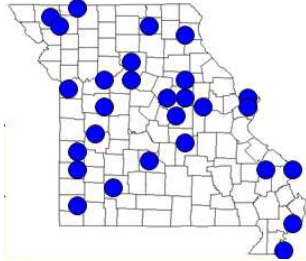
**Recovery comes quick with a few significant precipitation events...**



**Jan 29-Mar 10, 2013 precipitation: 7.58 inches**

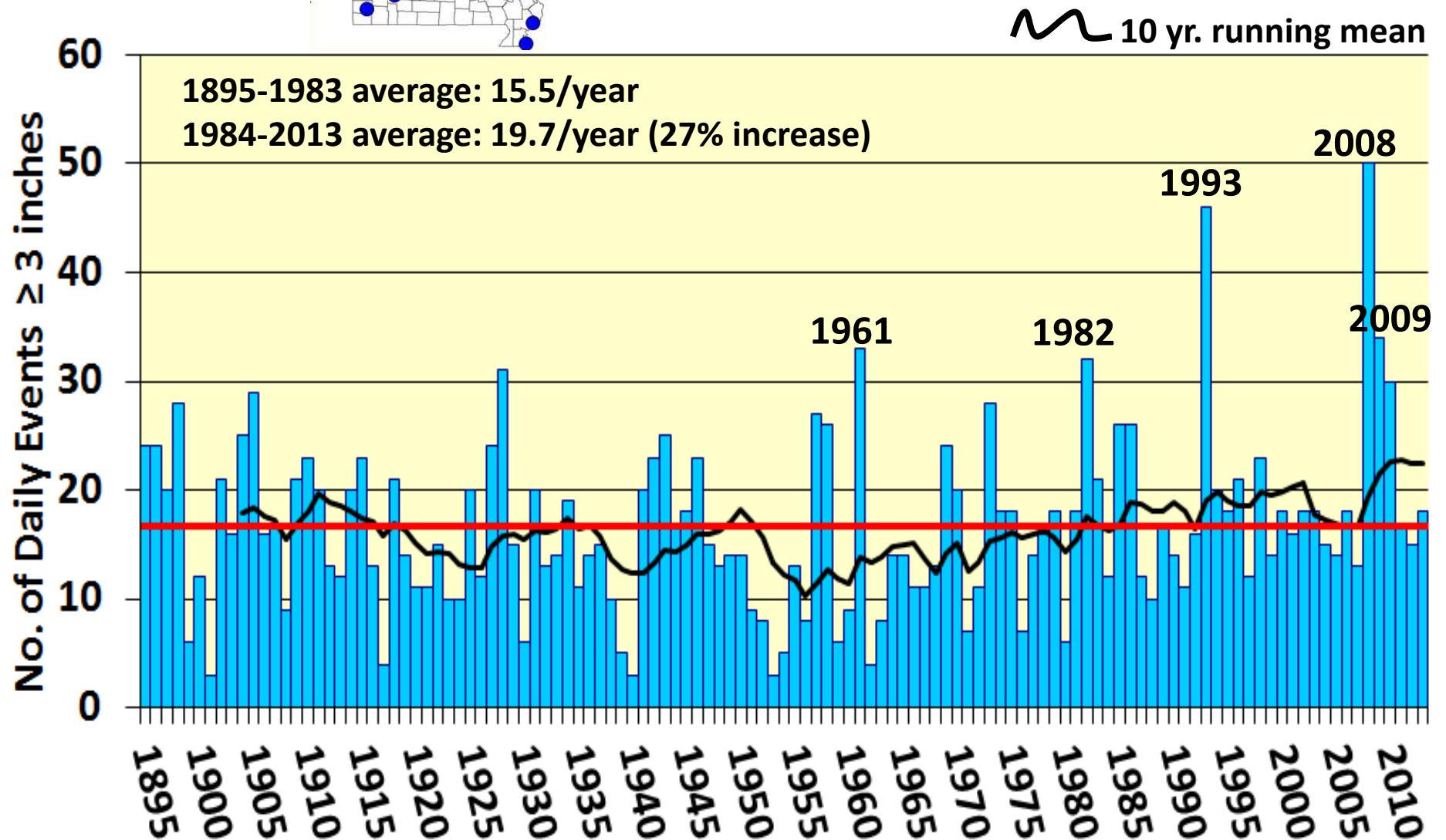
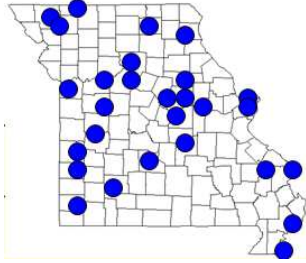


# Number of Daily Rainfall Events $\geq 1$ -inch in Missouri 1895-2013

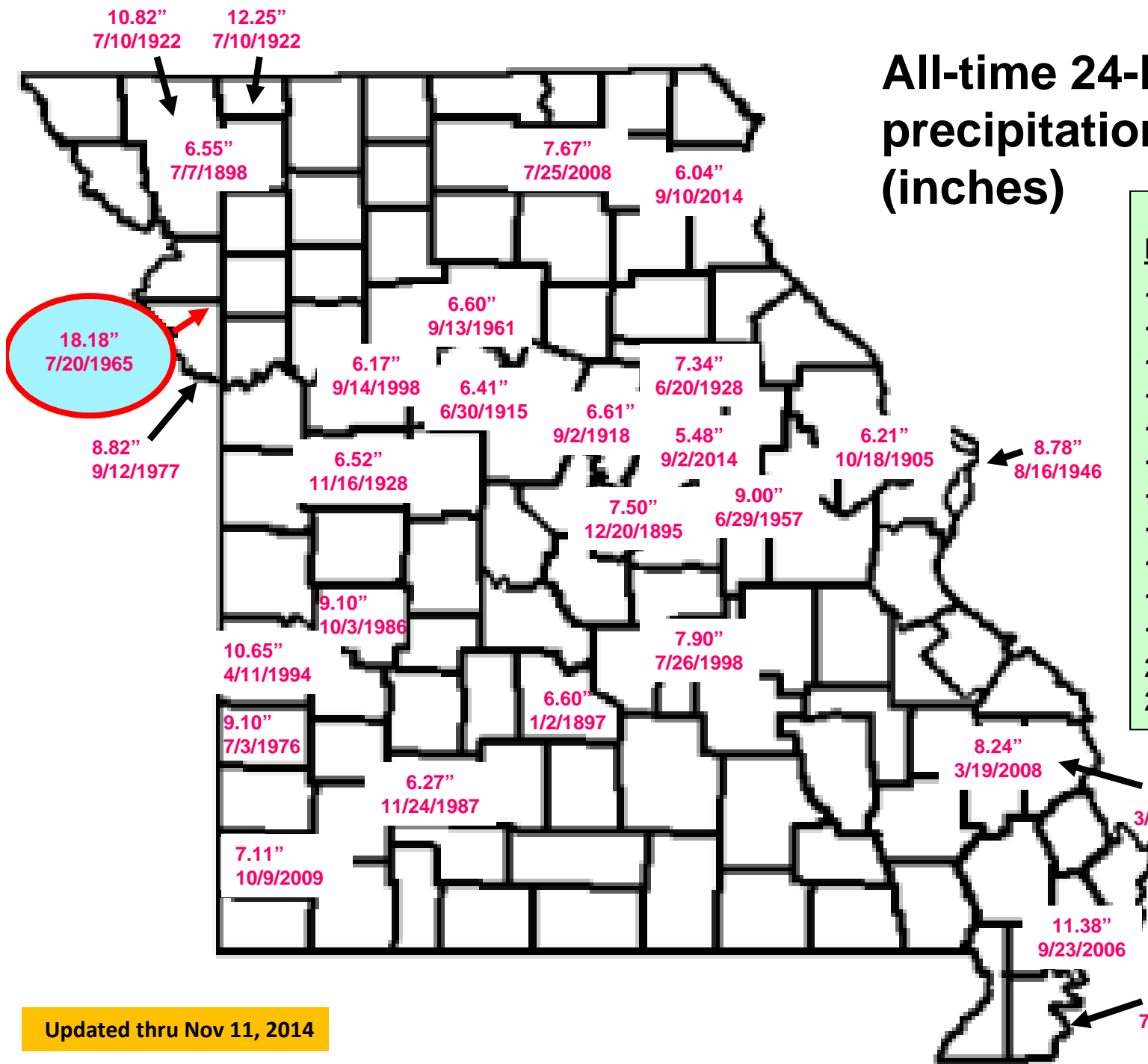


Data Source: Missouri Climate Center/NOAA

# Number of Daily Rainfall Events $\geq 3$ -inches in Missouri 1895-2013



Data Source: Missouri Climate Center/NOAA



Decade	No. of Records
1895-99	3
1900-09	1
1910-19	2
1920-29	4
1930-39	0
1940-49	1
1950-59	1
1960-69	1
1970-79	3
1980-89	2
1990-99	3
2000-09	5
2010-current	2

15 out of 28 records have occurred since the 1970's

Updated thru Nov 11, 2014

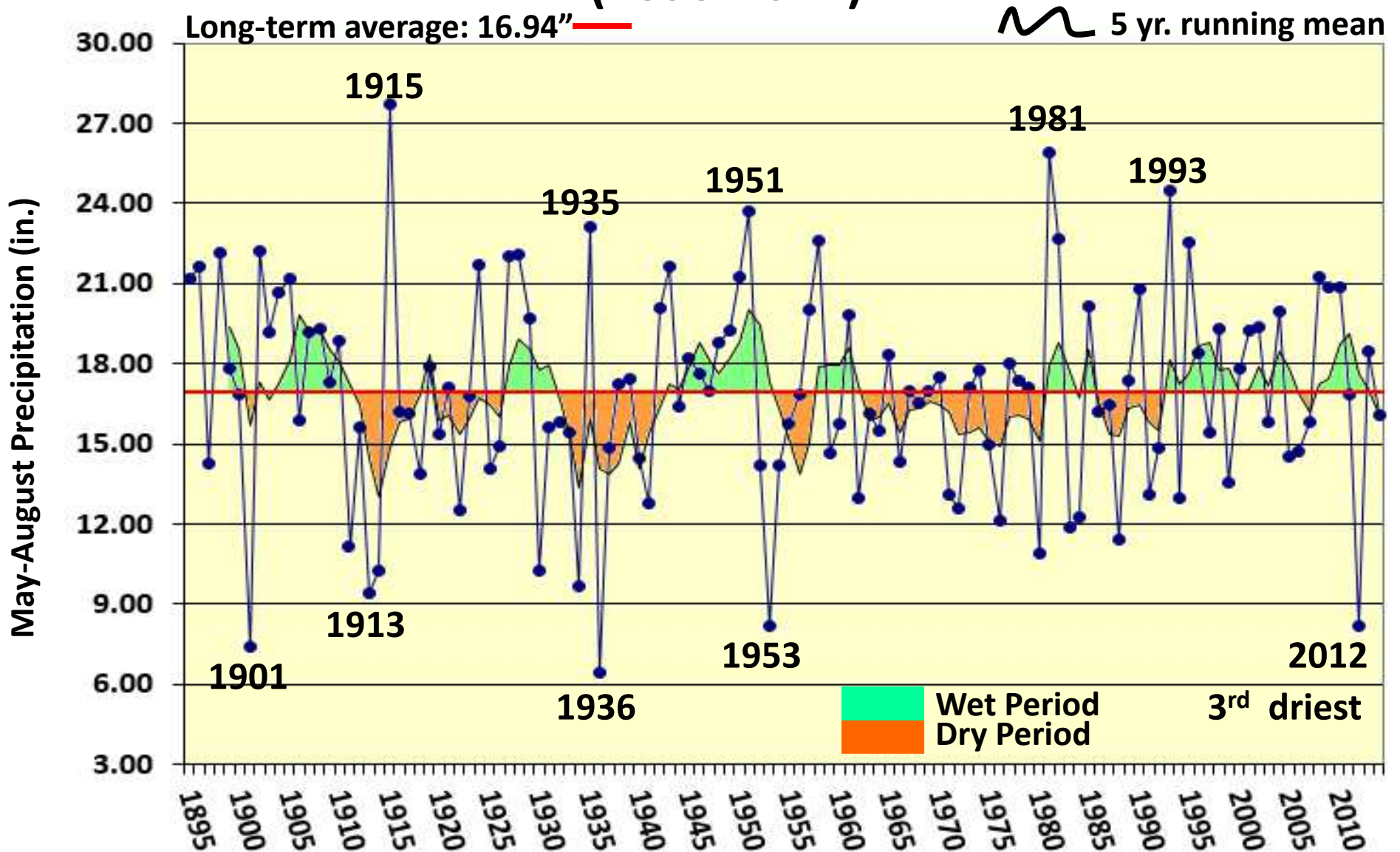
# Missouri's biggest vulnerability in climate is DROUGHT...



P. Guinan



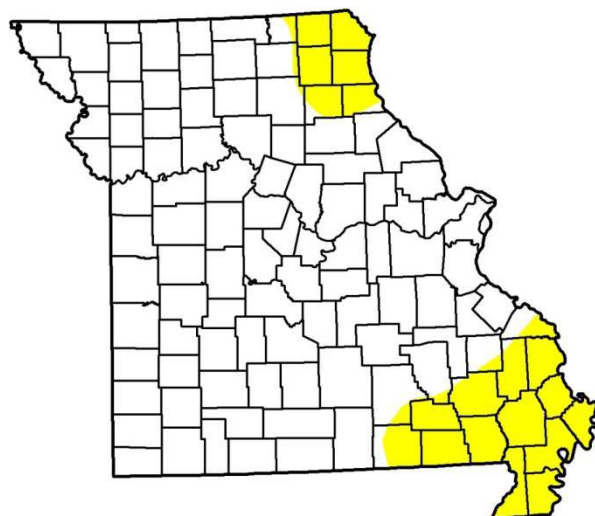
# Missouri May-Aug Average Precipitation (1895-2014)



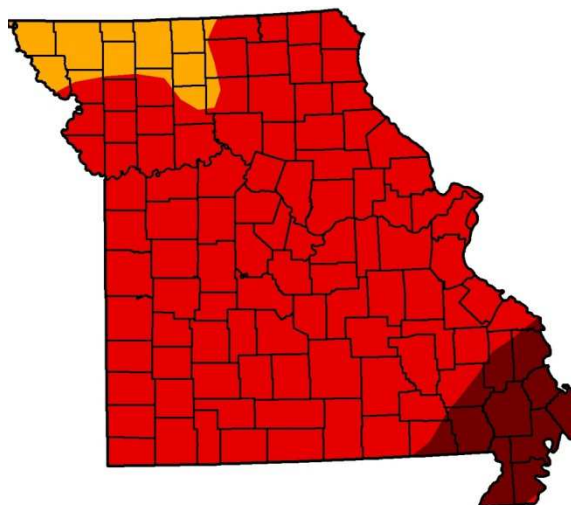
A rapidly developing drought impacted Missouri in Spring 2012

## U.S. Drought Monitor, Missouri

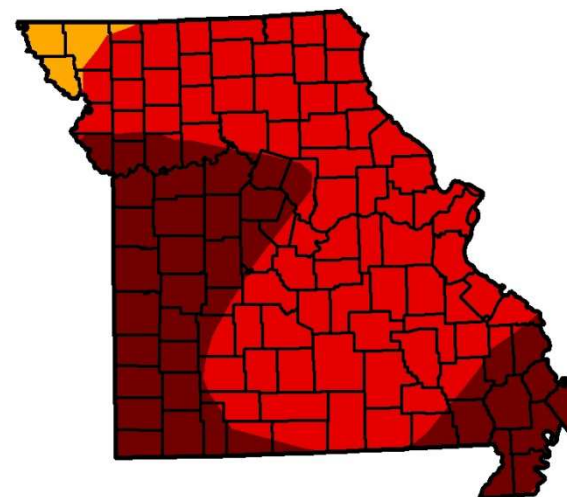
May 1, 2012



July 31, 2012








Aug 28, 2012



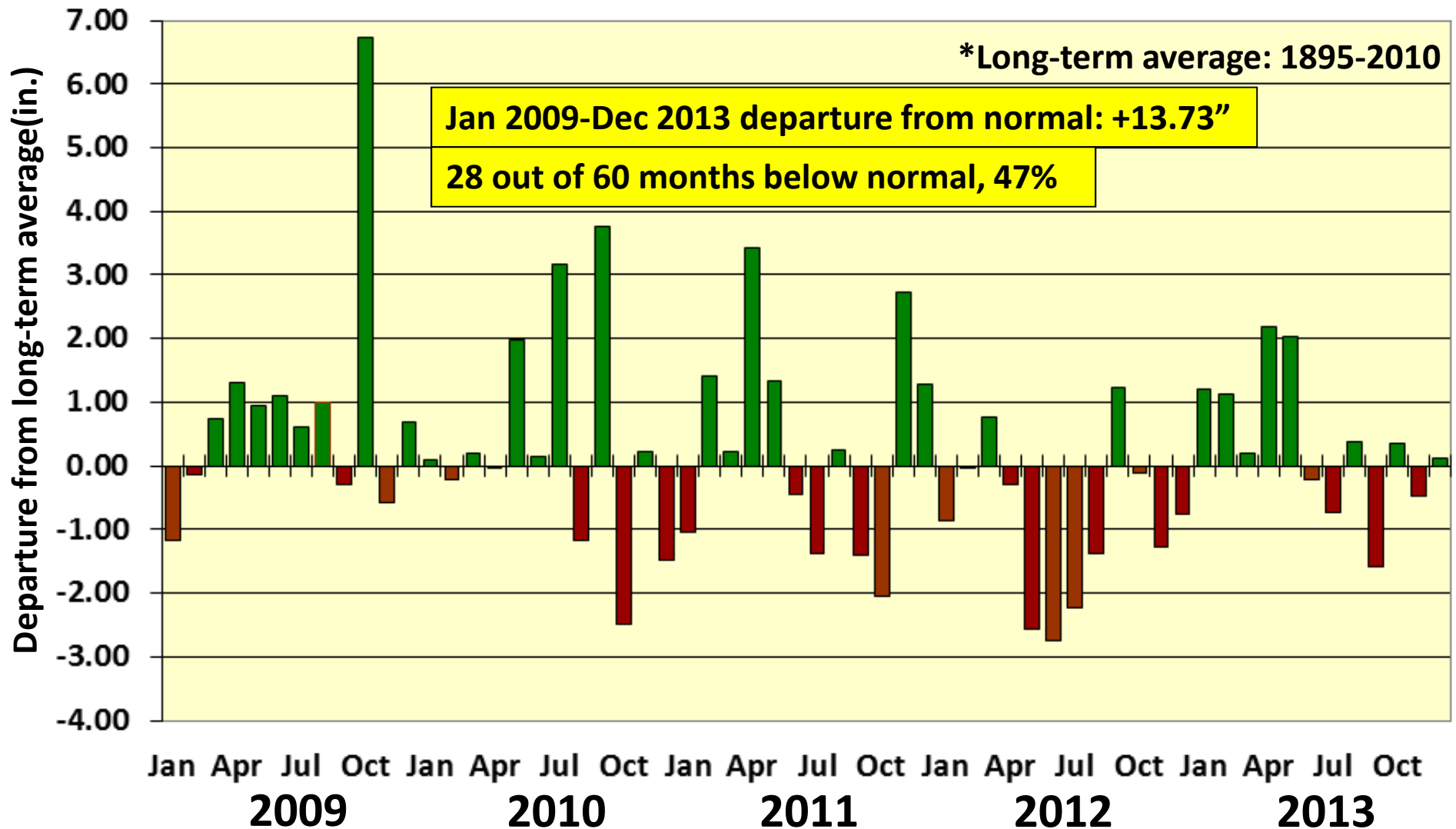
<http://droughtmonitor.unl.edu/>

### Intensity

-  D0 Abnormally Dry
-  D1 Drought - Moderate
-  D2 Drought - Severe
-  D3 Drought - Extreme
-  D4 Drought - Exceptional

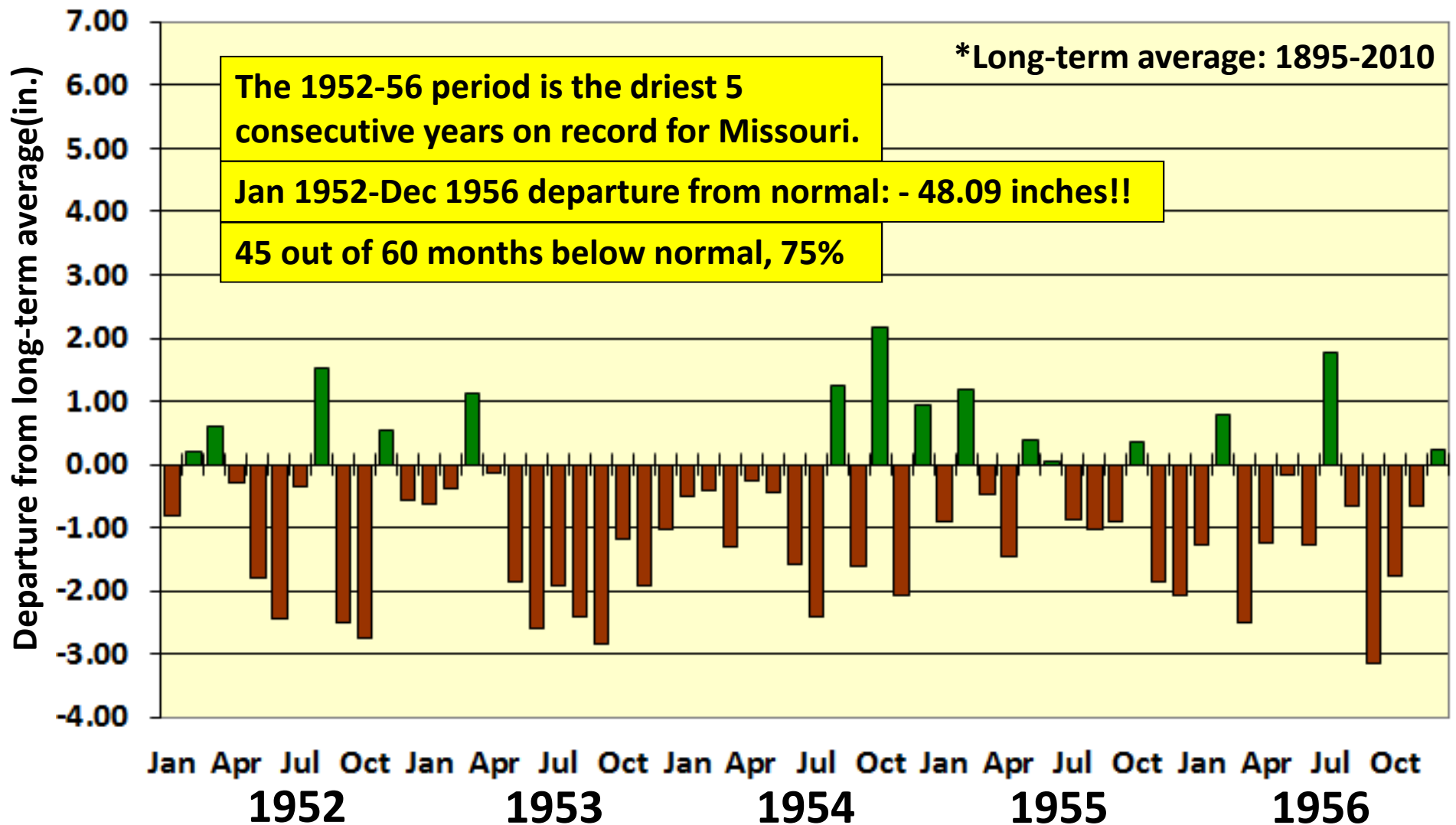
# Missouri Monthly Precipitation Departure From Average\*

## Jan 2009 – Dec 2013

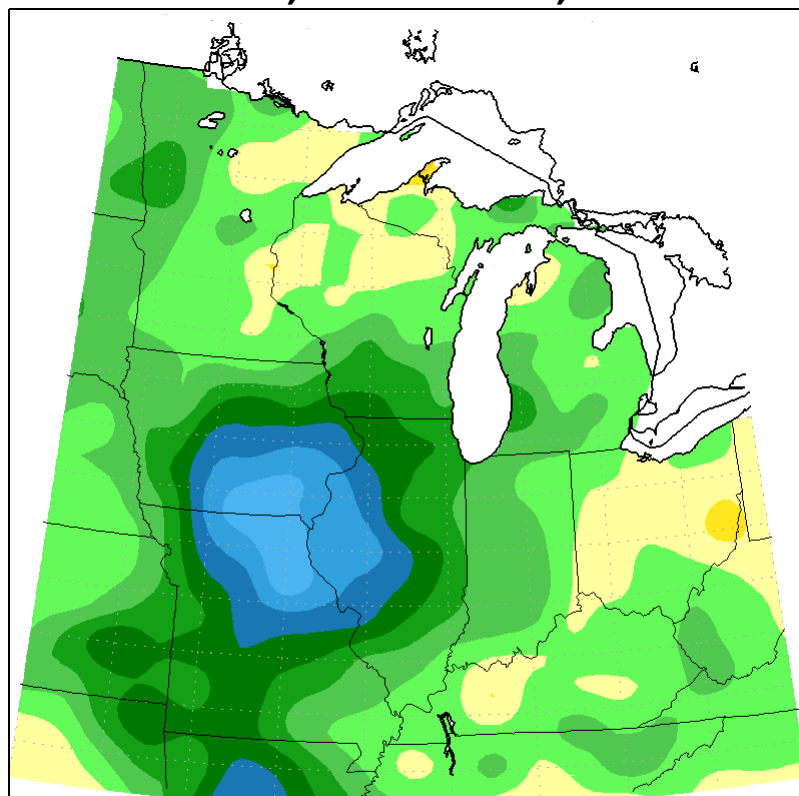


# Missouri Monthly Precipitation Departure From Average\*

## Jan 1952 – Dec 1956



## Total Precip. (in.): Departure From Mean Jan 1, 2008-Dec 31, 2010

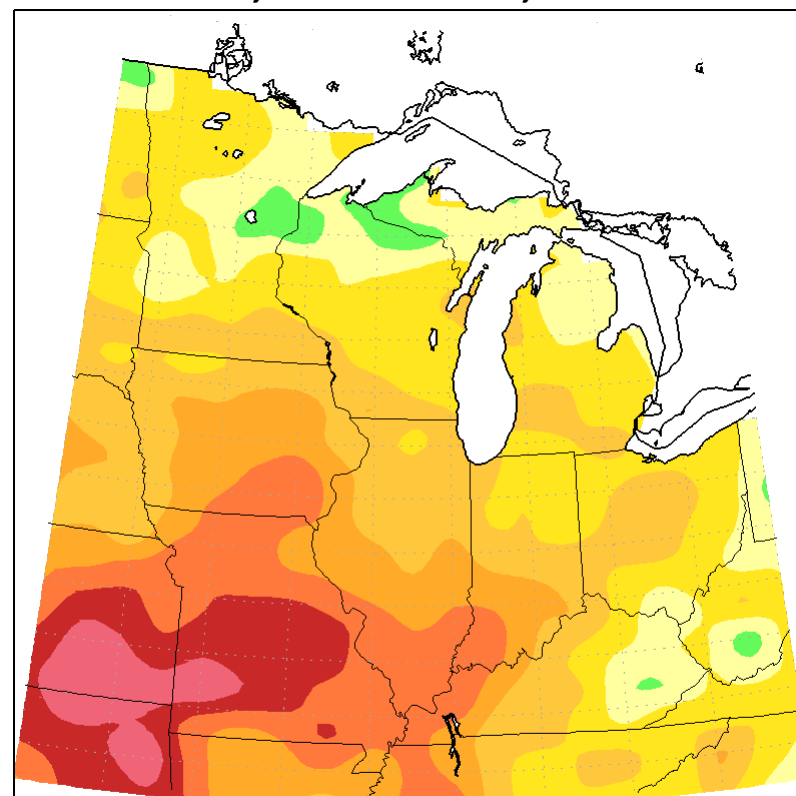


Mean period is 1981-2010.

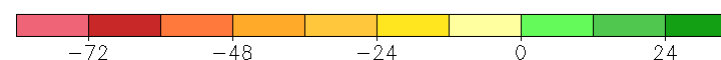


Midwestern Regional Climate Center

## Total Precip. (in.): Departure From Mean Jan 1, 1952-Dec 31, 1956



Mean period is 1981-2010.



Midwestern Regional Climate Center

# Missouri Climate Trends

- Recent historical trends for Missouri indicate an unprecedented multi-decadal wet period beginning in the early 1980's. Conversely, there have been multi-decadal dry periods, i.e. 1950's and 1960's.
- Dew point temperatures have trended above normal over the past few decades. Since 1981, 76% of the years have had above normal dew points for the Apr-Sep period. Also, since the early 1980's, 70% of the years have reported below normal evaporation totals for the Apr-Sep period, and the five lowest pan evaporation periods have occurred since 2008.
- No one anticipated the severity and magnitude of the 2012 drought and, similarly, no one knows what will happen next year.
- Extended dry and wet patterns can change abruptly and there are numerous occasions, where Missouri transitioned from one extreme to another in a short period of time.
- The 2012 drought resulted in numerous impacts, affecting many sectors in Missouri. However, it was a young drought when compared to other historic droughts, i.e. 1952-56. An important question we all need to consider is how prepared are we when the next 1950's drought affects the Show Me State?
- Using history as an indicator, I have a hard time believing the unprecedented wet trend we're currently experiencing will continue for another 30 years.

## Weather Resources on the Internet

<http://agebb.missouri.edu/weather/wealinks.htm>

## Missouri Climate Center

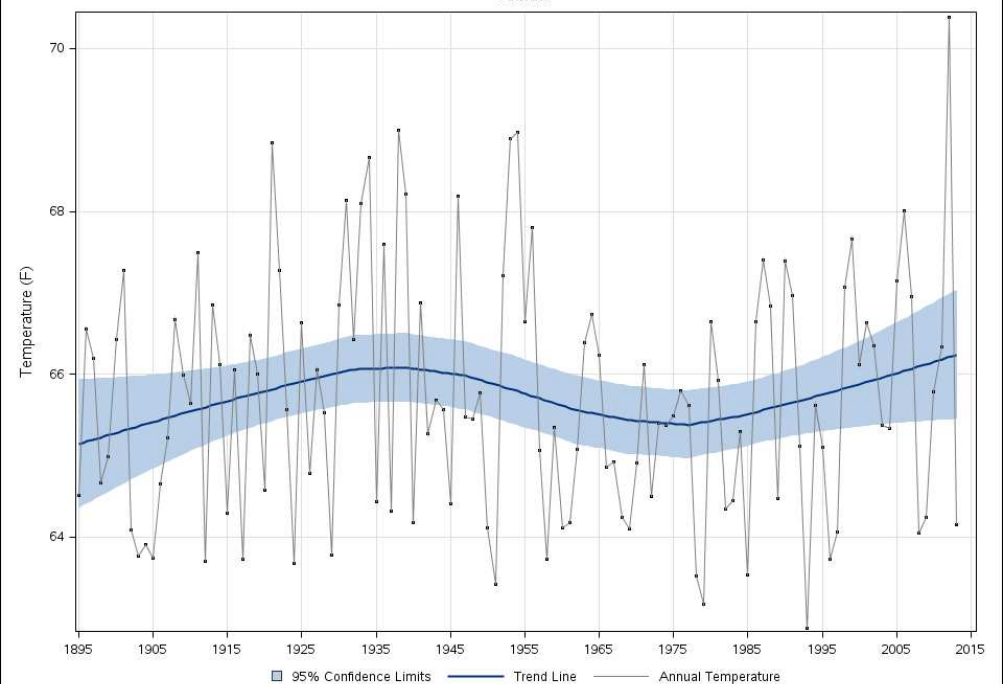
<http://climate.missouri.edu>

## River Information Resources for Missouri

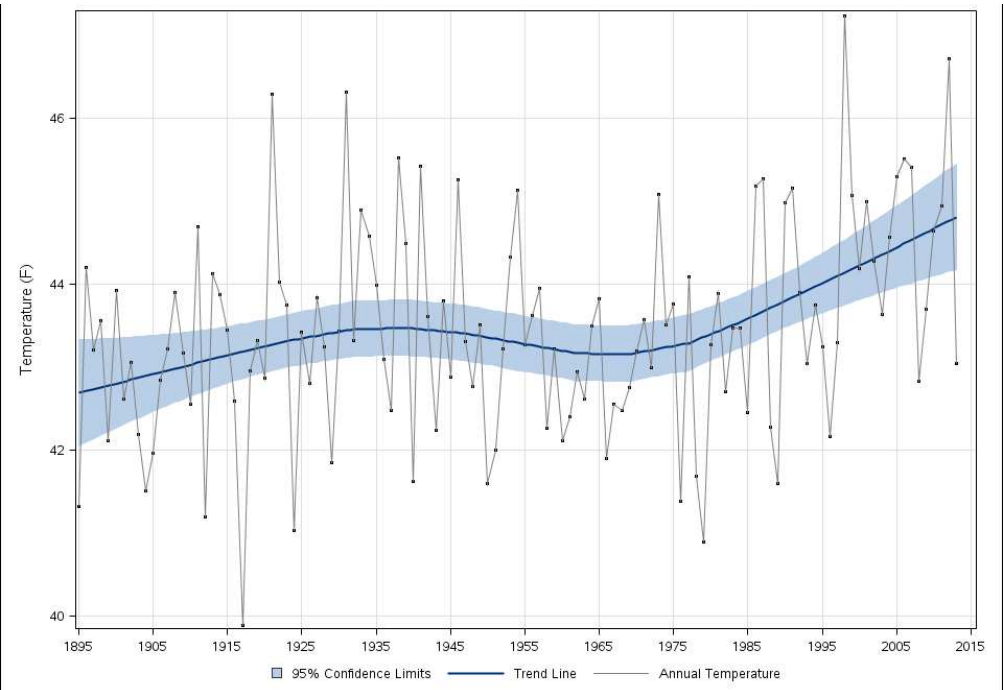
<http://agebb.missouri.edu/weather/river.htm>



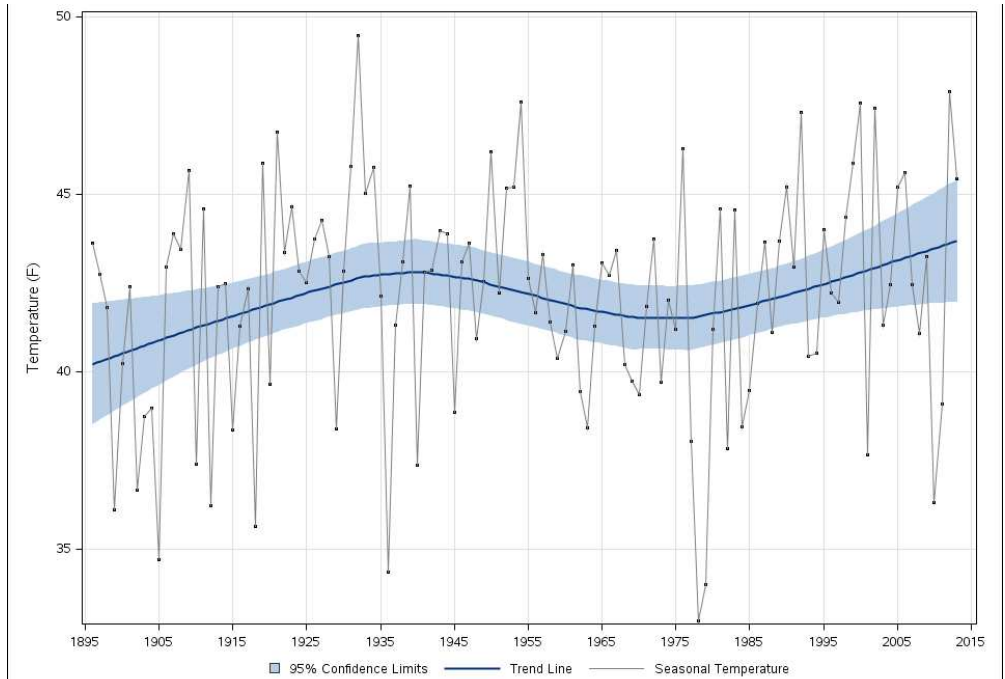
# Missouri Max Temp Annual 1895-2013



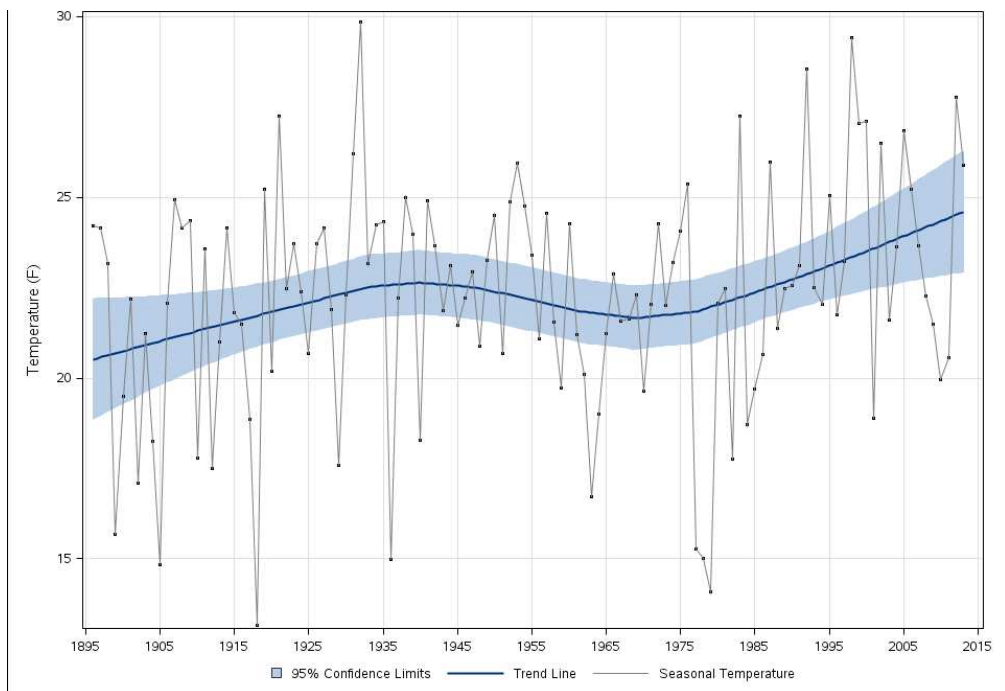
# Missouri Min Temp Annual 1895-2013



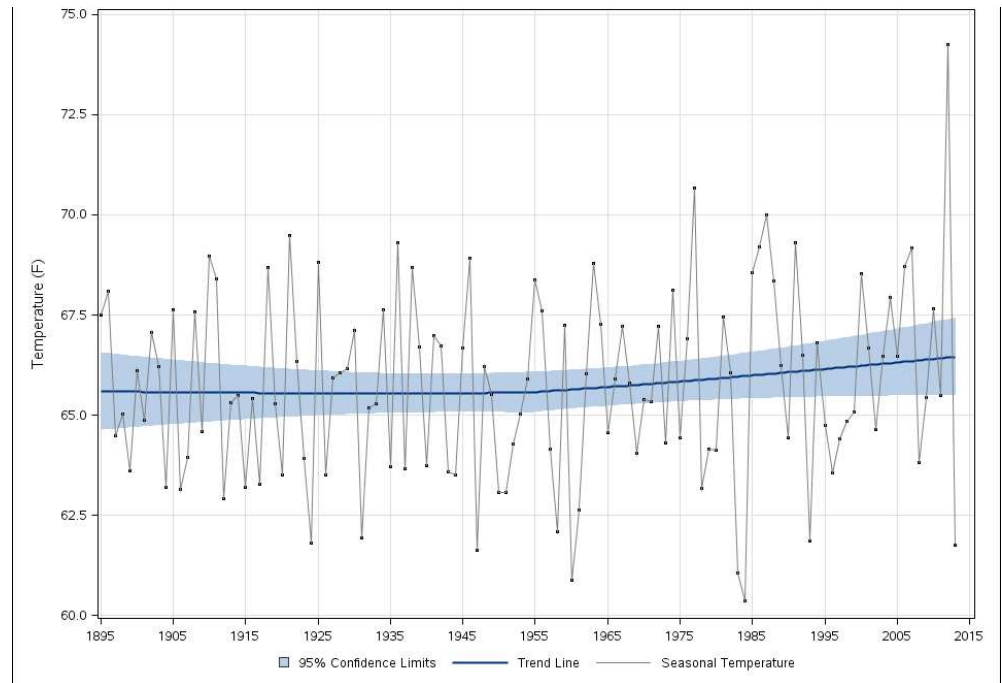
# Missouri Max Temp Winter 1895-2013



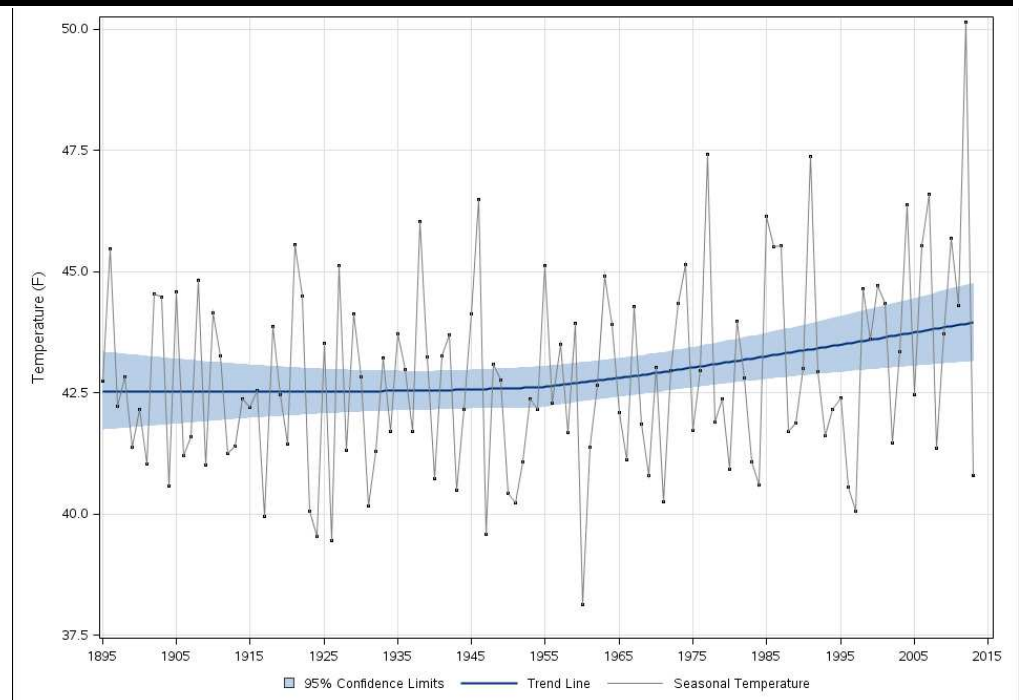
# Missouri Min Temp Winter 1895-2013



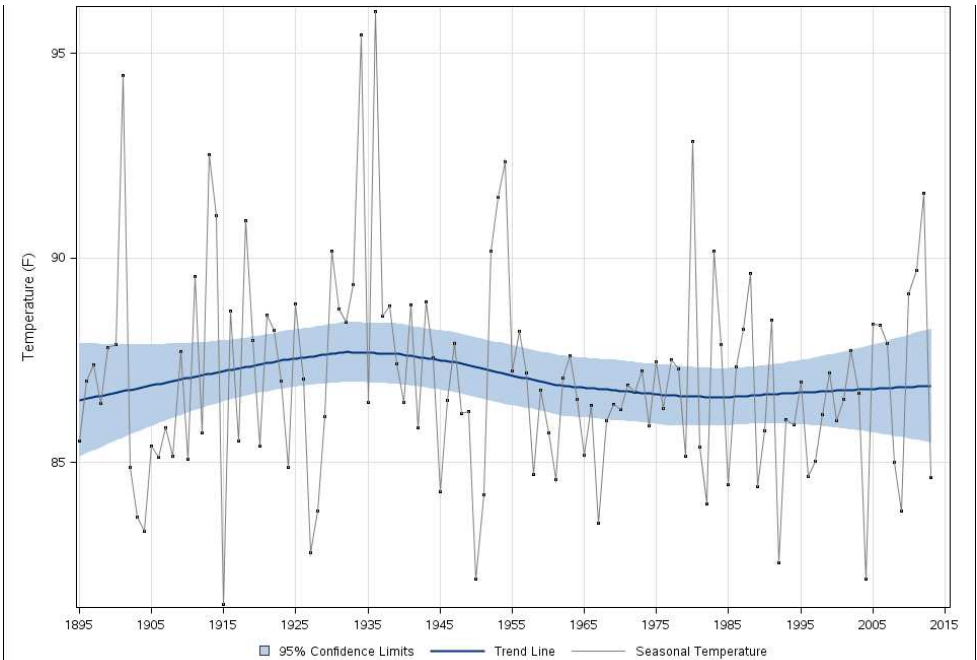
# Missouri Max Temp Spring 1895-2013



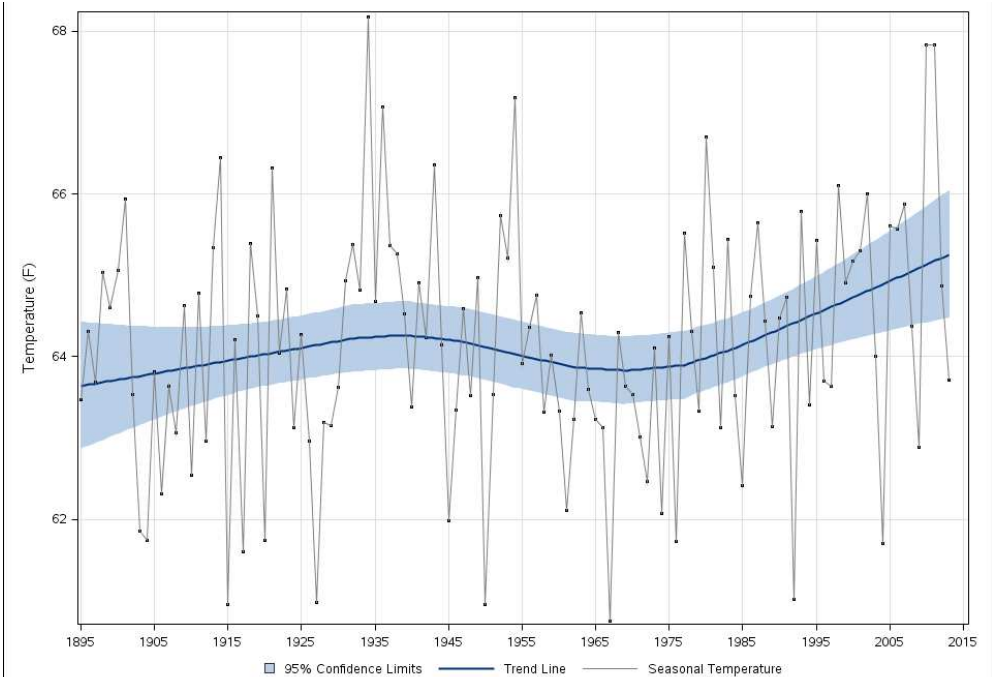
# Missouri Min Temp Spring 1895-2013



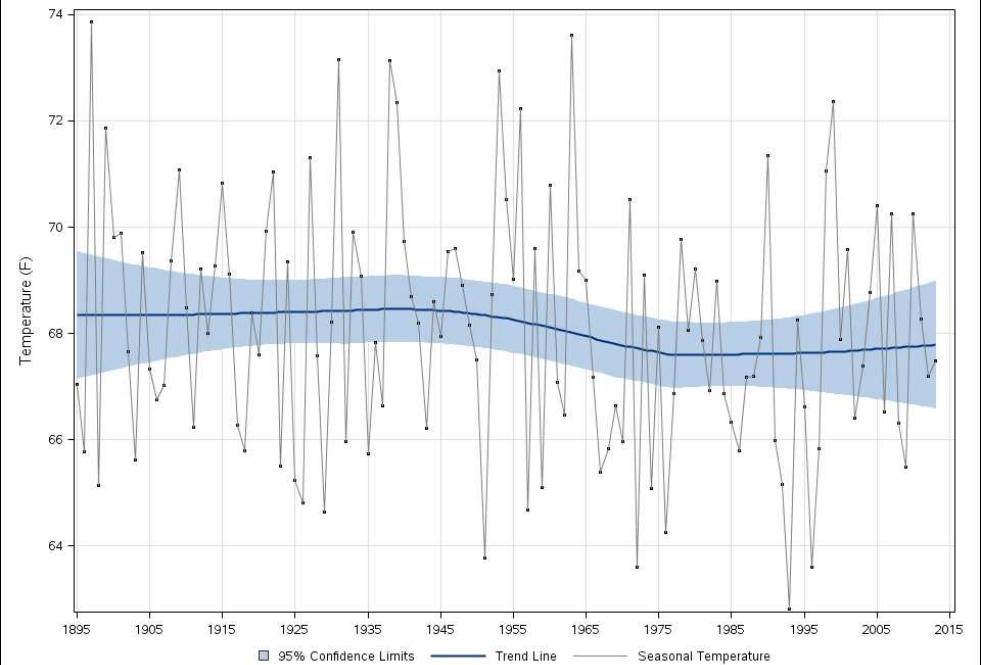
# Missouri Max Temp Summer 1895-2013



# Missouri Min Temp Summer 1895-2013



# Missouri Max Temp Fall 1895-2013



# Missouri Min Temp Fall 1895-2013

